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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/039,910	10/20/2001	Umit Tarakci	PA1884US	1005

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EXAMINER	
JAWORSKI, FRANCIS J	
ART UNIT	**PAPER NUMBER**
3737	

DATE MAILED: 10/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/039,910	TARAKCI ET AL.	
	Examiner	Art Unit	
	Jaworski Francis J.	3737	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 July 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-48 are* is/are pending in the application.

4a) Of the above claim(s) *10-14 and 18 - 47* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,15-17 and 48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claims 1 – 9, 15 – 17 and 48 are actively under examination in this case. Claims 10 – 14 and 18 – 47 remain withdrawn from consideration pursuant to restriction in paper No. 7. Applicants' re-introduction of claims 10 – 14 and 18 – 23 on page 10 of the July 16, 2004 amendment is noted however generic Claim 1 is not in condition for allowance, vide infra.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

[Parenthesized claim numbers pertain to the specific claim or claims addressed by the immediately preceding rejection.]

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over (a) Smith et al (US5744898, of record)) or (b) Chiang et al (US5690114, newly of record), in either case further in view of Miller et al (US5267221, newly of record) or Kunkel et al(US5648942, of record), alone or in the case of Chiang et al as base reference, further in view of Gilmore (US6043590, of record).

(a) Smith et al in Fig. 26 teaches an ultrasound scanhead system.including a signal generating and receiving unit (880, 890) and a cable-less coupling assembly which includes electrical pads (845 and 860 and also transducer lead surface distribution pads apparently akin to 16, 18, 20 – see cols. 8-9 bridging and col. 9 line 47 – 54) for intermediate elements which include an attenuative mismatch layer 840 having apparent through-vias for the signal leads (see elements 46, 54 and the col. 15 discussion) and anoptional MLC stage 850 in which lead re-distribution occurs to configure for the cable-less connection to the integrated circuits 880, 890 of the signal generating and receiving unit.

Smith et al .does not specifically teach use of conductive particles for the signal path through the attenuative backing layer 840. However it would have been obvious in view of Miller et al that when an attenuative intermediate element (37, 39 of Fig. 6) is connected by contact pads 35 to transducer 13's electrode 43, acoustic back-transmission which would ordinarily occur in the lead conductors due to metal being a good vibration transmitter (col. 6 lines 37 – 68) can be obviated by using very thin fibers instead of a single wire per lead, and this would apply to the Smith et al backing layer as well. In the alternative Kunkel et al similarly teaches that in order to mitigate back-transmission found in through leads within the backing layer metal particle-filled posts 12 may be used to disrupt the vibratory continuity which would otherwise be present in the leads within 840 of Smith et al while maintaining electrical continuity and with the attenuative material 14 as filler.(Col. 2 line 65 – col. 3 line 27) .

The distinction between Miller et al and Kunkel et al therefore for purposes of this rejection is that the Miller et al 'fibers' are argued to be 'conductive particles' since they are separated fragments functioning as a whole electrical lead whereas in Kunkel et al a narrower particle definition may be applied.

In either case the conductor-particle and attenuative backing layer is used in a cable-less coupling (meaning non-cable output connection, see Miller et al's attachment to circuit element 19 and Kunkel et al's proposed alternative col. 4 lines 17 – 34). (Claim 1).

(b) Chiang et al teaches an ultrasound portable scanner Fig. 32 and 33 which includes a signal generating and receiving unit (transmission circuit 1010, receiver circuit 1020), and a cable-less coupling assembly comprising intermediate elements (flex circuits 1037 and connector bus 1036), the ultrasound transducer array 1037 being connected to the signal generating and receiving boards by the intermediate elements in cable-less fashion. Applicants' apparently include such flex circuit or flexible ribbon connection as 1037 of Chiang et al to be 'cable-less' see specification para [0013] lines 14 – 1, although in Chiang et al the equivalent terminology 'ribbon cable' is used, in contradistinction to the large shielded output cable 1035 of Chiang et al as a cable type to be excluded by applicants' definition.

Chiang et al is in any case silent as to intermediate attenuative backing and therefore to a particle-comprised backing. However it would have analogously been obvious in view of Miller et al or Kunkel et al as described above to provide such a

backing in Chiang et al behind the transducer array, since both secondary references note that deleterious reflection which degrade the ultrasonic image may otherwise occur, particularly when a circuit board (19) is a mechanical impedance end terminus, see Miller et al col. 1 lines 59 – 63. Both Miller et al (22, 35, 41) and Kunkel et al (e.g. sputtered metal layer 16) suggests pads as electrical connections for the respective intermediate attenuative backings.

In the alternative and in deference to the fact that the lead-out from Chiang et al's array 1038 is a ribbon connector 1037, it would have been further obvious in view of Gilmore col. 2 lines 54 – 54 to include electrically conductive particles as filler in attenuative backing block 10 either merely as a 'loading' filler, meaning to adjust the impedance mismatch and attenuative value of the backing 10 (see col. 2 lines 45 – 54) as would be used in Chiang et al by suggestion of the secondary references, or in the alternative, Gilmore would further suggest the obviousness of modifying the Chiang et alv Miller et al/Kunkel et al combinations by using 'cable-less connection' flex circuits 24 in association with backing 10 connected to a transducer array such as 1038 of Chiang et al since this facilitates area array operation – see col. 3 lines 32 – 43 and Chiang et al is adapted for such flex circuit connections. (Claim 1).

Claims 2 - 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al and Chiang et al, alone or further in view of Miller (US6551248), further in view of Miller et al or Gilmore et al. The former are applied as discussed above, namely as systems comprising ultrasound transducer elements directly locally connected to complete signal generating and receiving units via connectors, and are

grouped together as a convenience to embrace certain of the well-known of the dependent claim features.. Whereas Chiang et al is per se silent as to acoustic isolation and in Smith et al the mismatch layer as described variously e.g col. 13 lines 35 – 42 is arguably an attenuative layer since it causes the acoustic back-vibration to re-radiate forwardly and not pass through, it would have been obvious in view of Miller et al to provide both an attenuative backing as well as a through connector therein in order to directly connect an array to underlying electronics while dampening back-vibrations which would otherwise destructively vibrate in the underlying circuit layer and re-radiate forward to degrade the image.

Note that in Smith et al and with respect to arguments in the response paper of July 16, 2004, the re-distribution layer whether effected by MLC technology or otherwise is simply an alternative option to direct connection of the transmission/reception units to transducer assembly connector pads 16, 18, 20. (See col. 9 line 47 – col. 10 line 9 and col. 10 lines 16 – 19).

Alternatively, it would have been obvious in view of Gilmore et al to combine the flex circuit connector 20 with the attenuative backing 10 for the arrays in the former such that one may have both a direct connection to circuitry as well as elimination of back-pressure wave radiation. In the alternative, Miller '655 notes that acoustic attenuative backing may occur behind the circuit board ICs or in the layer configurations of Figs. 8A or 8B. (Claim 2).

[Note: 1) With respect to Miller '655 the Examiner is assigning the patent's effective date 7/31/2001 as prior to applicants' parent Imran et al (US6569102) since col. 3 line 56 – col. 4 line 11 and col. 4 lines 36 – 47 therein appear to state that the array – circuitry interconnections as of that patent's filing were yet conventional. Please clarify if this interpretation be incorrect. 2) A local circuit/IC/printed circuit connection may not be to a signal generating and receiving unit proper, meaning that the local circuitry may be only on the receive side and/or be limited to pre-amps, protection diodes and switching multiplexers or electrical impedance matching components. Miller '655 is non-committal in this regard.]

A summary restatement of the gist of the Claim 1 and 2 rejections is as follows:

The Examiner is viewing the features of 1) cableless coupling/direct connection of array-to-signal generating unit and 2) an acoustic isolation/attenuation layer with or without metal particles as obvious since as noted in the secondary references it is the mechanical reverberations which then otherwise transmit to the signal generator and receiver components which may degrade the image hence the former feature necessitates the latter in accompaniment.

With respect to claim 3 the acoustic elements in all cases where piezoelectric comprise the piezoceramic generator portion and delivery electrodes, see Smith et al Fig. 1, Miller et al Figs. 1 and 4. (Claim 3).

Smith et al Fig. 5 shows a standoff window 100 and acoustic impedance matching layer 540, see Col. 13 bottom (Claim 4)..

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chiang et al and Smith et al, further in view of Miller et al or Gilmore et al as applied to claim 2 above, and further in view of Daigle (US5795297). Whereas the former are silent as to connection to a motherboard, it would have been obvious in view of Daigle to immediately connect motherboard 80 to the beamformer of the receive circuitry scanhead in the former as part of streamlined PC interfacing within the scan system. (Claim 50.

Claim 6-9, 15 – 17 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiang et al and Smith et al, further in view of Miller et al or Gilmore et al as applied to claim 2 above, and further in view of Kunkel. Whereas the former are silent as to kerf formation in the attenuative isolation layer, it would have been obvious in view of Kunkel Figs. 2 – 3 to organize this layer as attenuative non-conducting kerfs within 14 with attenuative conduction filler 12 in the kerfs to provide conductive posts. Note also re claim 6 that in Smith et al kerfs 13 between transducers are acoustically isolating and are filled with a filler material (col. 6 lines 31 – 35). (Claims 6 – 7, 15, 48)...

The conductive powder as described in col. 3 top would create an anisotropic conductor. (Claims 8, 16).

Miller et al per se in Fig. 7 teaches use of isotropic conductors as equivalents since .the fibers are generally parallel and directed vertically through the backing layer in the depicted orientation. (Claims 9, 17).

Response to Amendment Arguments

The arguments are generally addressed in the revised rejections above as they pertain to the newly presented and argued features.

The following additional art is cited as of interest as directed to direct array-to circuitboard connections and/or to area arrays towards which the cable output size problem is most relevant. Erikson (US6524254 Fig. 5B (wireless) and Fig. 6, 8 which explain the scanhead transmitter/receiver and its cable-end counterpart, Hasihimoto (US6483228) , Greenstein (US5329498) showing in Figs. 3-4 how scanhead IC circuitry may comprise functionality less than a complete signal generator and receiver.

Any inquiry concerning this communication should be directed to Jaworski Francis J. at telephone number 703-308-3061.

Francis J. Jaworski
Primary Examiner

FJJ:fjj

10-20-2004